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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/775,917	02/09/2004	Olivier Rayssac	4717-13100	1187

28765 7590 08/14/2006

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EXAMINER

TRINH, MICHAEL MANH

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 08/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/775,917	Applicant(s) RAYSSAC ET AL.	
	Examiner Michael Trinh	Art Unit 2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 June 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5,8-14 and 16-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5,8-14 and 16-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

*** This office action is in response to Applicant's Amendment and RCE filed June 14 2006. Claims 1-5,8-14,16-20 are pending.

*** The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 112

1. Claims 1-5,8-14,16-19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In view of Applicant's remark (6/5/06 remark page 6) about "The present claims...to have a very thin self supported layers, i.e., less than 30-35 μm ...". Re base claims 1 and 19, meaning and scope of "...a reduced thickness that corresponds to a desired thickness for constituting a self-supporting thin layer..." are unclear and indefinite for how of desired thickness and how thin of the layer (relative terms) are considered as a self-supporting thin layer.

(Dependent claims are rejected as depending on rejected base claims)

Claim Rejections - 35 USC § 103

2. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matsui et al (6,191,007) taken with Tayanaka (6,107,213).

Re claim 19, Matsui teaches (at least in Figs 22; col 34, line 57 through col 35; Figs 1-23,34; cols 12-28) method of thinning a wafer made of semiconductor material, the wafer (118 in Fig 22) having first and second opposing faces, which comprises: providing at least one electronic component or circuit (115 in Fig 22; 225/223 in Fig 34; 2,3 in Figs 1-4; col 12, lines 1-35) on the first face of the wafer; implanting atomic species through the second face and into the wafer to obtain a zone 120 of weakness at a predetermined depth therein (Fig 22, col 34, line 57 through col 35; col 28, lines 38-52; col 34, lines 25-55), the zone defining a first portion of the wafer extending from the zone to the first face and a remaining portion constituted by the remaining portion of the wafer; removing the remaining portion from the first portion along the zone of weakness to thin the wafer (Figs 2C,3C,210-22); wherein it is not necessary to perform

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the last step of repeating the implanting and removing steps until the first portion has a reduced thickness that corresponds to a desired thickness for constituting a self-supported thin layer for the electronic component or circuit.

Re claim 19, Matsui lacks applying a stiffener to a second face prior to removing step.

However, Tayanaka teaches (at Figs 3B-3C; col 15, lines 22-45) applying a stiffener 15/14 to both first and second faces of the wafer prior to removing the remaining portions.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a thin electronic device layer of Matsui by applying at least a stiffener to a second face of the wafer prior to removing the remaining portions as taught by Tayanaka. This is because of the desirability to facilitate the step of thinning of the wafer by removing the remaining portions, wherein the stiffeners cover and protect both second and first faces of the wafers during separation.

3. Claims 1-4,7-11,16-18,20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsui et al (6,191,007) taken with Tayanaka (6,107,213), as applied to claim 19 above, and further of Hanson et al(5,920,764).

Re claim 1, Matsui and Tayanaka teach method of thinning a wafer made of semiconductor material as applied to claim 19 above and repeated herein. Re further claim 2, thinning the wafer by a mechanical polishing method is prior to the implanting of the atomic species (col 35, lines 21-28). Re claim 3, Matsui also teaches providing at least one electronic component or circuit (115 in Fig 22; 225/223 in Fig 34; 2,3 in Figs 1-4; col 12, lines 1-35) on the first face of the wafer prior to the implanting of the atomic species. Re claim 4, wherein the remaining portion of the wafer is removed by applying a heat treatment (col 13, lines 60 through col 14). Re claim 7, wherein applying a stiffener (Fig 2C; 6,8,5) to the second face of the wafer 1 prior to removing the remaining portion by the application of a heat treatment (col 12, lines 40 through col 13; col 13, line 60 through col 14). Re claim 8, wherein the stiffener 6 is formed by deposition (col 12, lines 40-48). Re claim 9, wherein the stiffener 5 comprises a layer of silicon oxide (col 12, lines 35-48; Fig 2C). Re claim 10, wherein the stiffener 8,5,6 comprises a rigid plate (col 12, line 35 through col 13; col 25, lines 23-25). Re claim 11, wherein the rigid plate comprises a monocrystalline (col 13, lines 25-32) or polycrystalline silicon material (col 12, lines

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40-48). Re claim 16, wherein the wafer comprises silicon (col 11, line 65 through col 12, line 8). Re claim 17, wherein the wafer comprises a silicon on insulator wafer (col 11, lines 60-65; col 35, lines 60-67; col 17, lines 29-50). Re claim 18, wherein the wafer comprises germanium, an alloy of silicon and germanium, silicon carbide (col 64, lines 49-56). Re further claim 20, Matsui also teaches removing the remaining portion as a self-supporting layer having a thickness of less than 35 micron from the first portion along the zone of weakness to thin the wafer (10 to several tens of microns at col 62, lines 1-8; 1-47; Fig 64D; 0.1 to 2 microns at col 15, lines 11-20).

Re claim 1, Matsui lacks mentioning the last step of claim 1, necessary, that repeating the implanting and removing steps until the first portion has a reduced thickness.

However, Hanson teaches (at Figs 4-5,3,1; col 4, lines 37-40; col 1, line 1 through col 2; col 4, line 6 through col 5) performing a Smart-Cut process by implanting hydrogen into the wafer to form a zone of weakness, and removing the portion to thinning the wafer, wherein, if required, the process of implantation, heating, and fracture can be repeated until the desired thickness are removed so as to retain a wafer having reduced thickness (col 4, lines 37-40).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to thinning a wafer made of a semiconductor material of Matsui by repeating the implanting and removing steps until the desired thickness are removed first portion has a reduced thickness, if required and if necessary, the process of implantation, heating, and fracture can be repeated until the desired thickness are removed, as taught by Hanson. This is because of the desirability to thinning and reduce a wafer having a desired thickness so that a thin wafer and small semiconductor devices can be fabricated.

4. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matsui et al (6,191,007) taken with Tayanaka (6,107,213) and Hanson et al (5,920,764), as applied to claims 1-4,7-11,16-18 above, and further of Henley (6,291,314).

The references including Matsui, Tayanaka, and Hanson teaches (at least in Figs 22; col 34, line 57 through col 35; Figs 1-23,34; cols 12-28) method of thinning a wafer made of semiconductor material as applied to claims 1-4,7-11,16-18 above.

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Re claim 5, as described above, the references already teach removing the remaining portion of the wafer by heating, but lack blowing a jet of fluid adjacent the zone of weakness.

However, Henley teaches (at Fig 14; col 19, line 51 through col 21) removing the remaining portion by heating or blowing a jet of fluid adjacent the zone of weakness (col 20, 62 through col 21; col 20, lines 35-67).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to removing the remaining portion of the wafer of Matsui by heating or blowing a jet of fluid adjacent the zone of weakness, as taught by Henley, because these removing techniques are alternative and art recognized equivalent methods for removing a portion of the wafer in an effective and reliable manner.

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matsui et al (6,191,007) taken with Tayanaka (6,107,213) and Hanson et al (5,920,764), as applied to claims 1-4,7-11,16-18 above, and further of Kang et al (6,287,941).

The references including Matsui, Tayanaka, and Hanson teaches (at least in Figs 22; col 34, line 57 through col 35; Figs 1-23,34; cols 12-28) method of thinning a wafer made of semiconductor material as applied to claims 1-4,7-11,16-18 above.

Re claim 6, as described above, the references already teach removing the remaining portion of the wafer, but lack mentioning to remove the portion by scrubbing.

However, Kang et al teach (at col 9, lines 35-38; col 9, lines 14-67) to remove a portion of the wafer by scrubbing using a chemical mechanical polishing apparatus.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to remove a portion of the wafer of the references including Matsui by scrubbing with the use of a chemical mechanical polishing apparatus as taught by Kang, because scrubbing with the use of CMP polishing apparatus is an effective technique for removing a portion of the wafer in an effective manner so that leave a smooth surface.

6. Claims 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsui et al (6,191,007) taken with Tayanaka (6,107,213) and Hanson et al (5,920,764), as applied to claims 1-4,7-11,16-18 above, and further of Aspar et al (6,020,252) and Sayyah (2002/0055237).

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The references including Matsui, Tayanaka and Hanson teaches (at least in Figs 22; col 34, line 57 through col 35; Figs 1-23,34; cols 12-28) method of thinning a wafer made of semiconductor material as applied to claims 1-4,7-11,16-18 above.

As described above to claim 10, the references already teach applying a stiffener comprising a rigid plate 8,5,6 (Matsui, col 12, line 35 through col 13; col 25, lines 23-25), but lack to use a stiffener comprising a flexible film (claim 12) or an adhesive film (claim 13), a wax layer (re claim 14).

However, Aspar teaches (at col 6, lines 6-39; Figs 3-4) applying a stiffener 8 comprising a rigid or flexible support (re claim 12), wherein the stiffener comprises an adhesive film (claim 13, col 6, lines 12-18). Tayanaka also teaches forming the stiffener 14/15 comprising a flexible support 15 including an adhesive layer 14 (Figs 3B-3C; col 15, lines 23-40). Sayyah also teaches (at Figs 1c-1g; col 1, paragraphs 6,34-36) using a release stiffener layer comprising an adhesive or a wax layer (paragraph 0006).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to remove a portion of the wafer of the references including Matsui by applying a stiffener on the substrate, wherein applying a stiffener 8 comprising a rigid or flexible support, wherein the stiffener comprises an adhesive film (col 6, lines 12-18), as taught by Aspar and Tayanaka, wherein using an adhesive or a wax layer is further taught by Sayyah. This is because these stiffeners of rigid or flexible and adhesive or wax layers are alternative and art recognized equivalent materials that can be effectively used as a support and release layer during the step of removing a portion of the wafer.

7. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Matsui et al (6,191,007) taken with Tayanaka (6,107,213), Hanson (5,920,764), as applied to claims 1-4,7-11,16-18, and Aspar et al (6,020,252) and Sayyah (2002/0055237), to claims 12-14, and further of Nuyen (5,827,751).

The references including Matsui, Tayanaka, and Hanson teaches (at least in Figs 22; col 34, line 57 through col 35; Figs 1-23,34; cols 12-28) method of thinning a wafer made of semiconductor material as applied to claims 1-4,7-11,16-18 above.

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Re claim 15, the relied references already teach applying a stiffener, but lacks mentioning to remove the stiffener thereafter.

However, Nuyen teaches (at Fig 1-9) applying a stiffener 8,6 to the substrate prior to removal of the remaining portion, and removing the stiffener after having obtained the self-supported thin layer (Fig 9; col 4, lines 58-67; col 3, lines 54 through col 4).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to remove a portion of the wafer of the references including Matsui by applying a stiffener on the substrate prior to removal the portion, and thereafter removing the stiffener after having obtained the self-supported thin layer, as taught by Nuyen. This is because of the desirability to release and transfer the thin layer to a permanent substrate.

Response to Amendment

8. Applicant's remarks submitted June 05, 2006 have been fully considered but they are not persuasive, and in view of the new ground(s) of rejection.

Applying a stiffener on both faces prior to removing is taught by the relied reference of Tayanaka.

Nowhere in the claims 1 and 19 require the self-support thin layers having a less than 30 μm or about 35 μm in order to be a self-supporting thin layers. Claimed subject matter, not the specification, is the measure of invention. Limitations in the specification cannot be read into the claims for the purpose of avoiding the prior art. In *Re Self*, 213 USPQ 1,5 (CCPA 1982); In *Re Priest*, 199 USPQ 11,15 (CCPA 1978). Moreover, Matsui also teaches removing the remaining portion as a self-supporting layer having a thickness of less than 35 micron from the first portion along the zone of weakness to thin the wafer, wherein a thin layer has a thickness of about 10 microns to several tens of microns is disclosed at column 62, lines 1-8; 1-47; Fig 64D; with 0.1 to 2 microns at col 15, lines 11-20 ("several" is defined as being more than two or three but not many). This thin layer together with circuit layers on its first face is having a thickness for constituting a self-supported thin layer for the electronic component circuit formed thereon.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (571) 272-1847. The examiner can normally be reached on M-F: 9:00 Am to 5:30 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The central fax phone number is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Oacs-17

A handwritten signature in black ink, appearing to read "Michael Trinh", is positioned above the printed name.

Michael Trinh
Primary Examiner